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(54) **Vehicle tire air pressure detecting device and cast wheel for mounting the device**

(57) A rim drop section (64) dented in a shape of a ring is provided on an inner side of a bead seat section (62) of a rim (53) for holding a bead section of a tire, further, a recessed section (54) is provided on this rim drop section (64), and to this recessed section (54) a detecting device main body (51) of a tire air pressure

detecting device (41) is accommodated.

When a tire is assembled on a cast wheel (25) by utilizing a tire changer or the like, or when the tire is removed from the cast wheel (25), the bead sections of the tire are prevented from interfering with an air pressure sensor (41), and damaging of the air pressure sensor (41) is prevented.

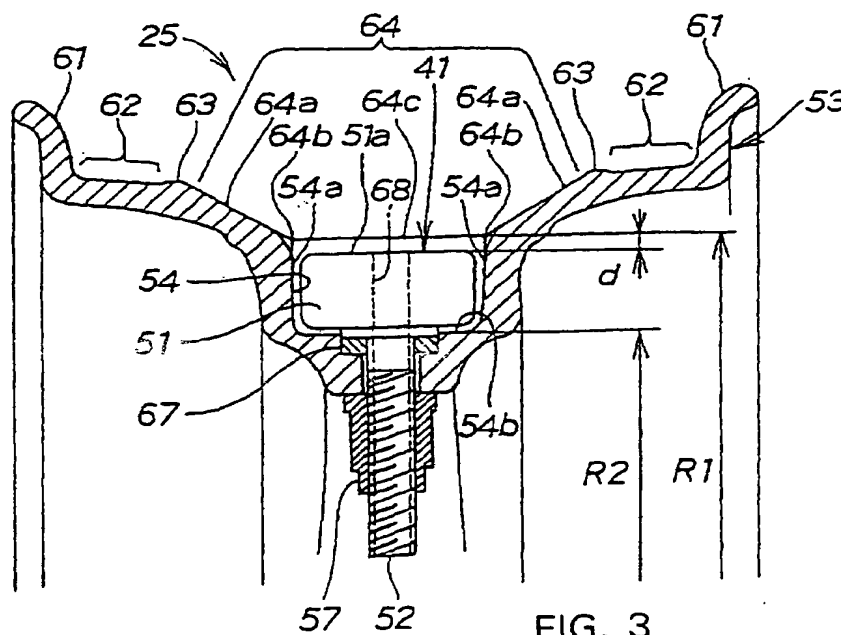


FIG. 3

Description

[0001] The present invention relates to an on vehicle tire air pressure detecting device and a cast wheel for mounting the device capable of preventing the device from interfering with bead sections of a tire when the tire is assembled to a cast wheel or the tire is removed from the cast wheel.

[0002] As an on vehicle tire air pressure detecting device for detecting whether an air pressure of a vehicular tire is lowered or not, for example, Japanese Unexamined Patent Publication H10-44726 "Tire air pressure warning device" is well known.

[0003] In Fig. 1 of the patent publication described above, a state mounted with the tire air pressure warning device constituted of a transmission section 7 and a valve stem 10 on a wheel rim 1 by a nut 9 is disclosed.

[0004] In an art of the patent publication described above, in a case where a case 2 of a tire air pressure warning device is projected on a side of a tire, it is considered that when assembling a tire on a wheel rim 1, bead sections of the tire are interfered with the case 2.

[0005] Thus, an object of the present invention is to prevent bead sections of a tire from interfering with an on vehicle tire air pressure detecting device when assembling the tire on a cast wheel, or removing the tire from the cast wheel.

[0006] In order to achieve the object described above, claim 1 is characterized in that in a tire air pressure detecting device for detecting a tire air pressure by an air pressure sensor mounted on a rim of a vehicular cast wheel, wherein a rim drop section dented in a shape of a ring is provided on inner sides of a bead seat sections of a rim for holding bead sections of the tire, further, a recessed section is provided in the rim drop section, and an air pressure sensor is accommodated in this recessed section.

[0007] By accommodating the air pressure sensor in the recessed section of the rim, when the tire is assembled on the cast wheel by utilizing a tire changer or the like or the tire is removed from the cast wheel, the bead sections of the tire are prevented from interfering with the air pressure sensor, and the damaging of air pressure sensor is prevented.

[0008] Claim 2 is characterized in that in a tire air pressure detecting device for detecting a tire air pressure by an air pressure sensor mounted on a rim of a vehicular cast wheel, wherein, the air pressure sensor is formed in a shape of a curve along an inner side surface of the rim.

[0009] By constituting the air pressure sensor in the shape of the curve along the inner side surface of the rim, and by eliminating a projecting section of the air pressure sensor to the tire side, when the tire is assembled on the cast wheel, or is removed from the cast wheel, the bead sections of the tire are prevented from interfering with the air pressure sensor, and damaging of the air pressure sensor is prevented.

[0010] Claim 3 is characterized by integrally molding a weight section with the rim for being easily balanced with the air pressure sensor at a position shifted at an angle of 180° to a peripheral direction from a position where the air pressure sensor is mounted on the rim.

[0011] By being integrally molded a weight section with the rim, a cast wheel is easily in balance, a necessity to mount or to affix specific weight to the cast wheel in an attempt to be in a good wheel balance is eliminated, and workability is improved.

[0012] An embodiment of the present invention will be explained hereinafter on the basis of the attached drawings. In the meantime, the drawings are to be viewed in a direction whereto numerals are written.

Fig. 1 is a side elevation view of a motorcycle being provided with an on vehicle tire air pressure detecting device relating to the present invention,

Fig. 2 is a first sectional view of a mounting state of a tire air pressure detecting device in an air pressure detecting device relating to the present invention,

Fig. 3 is a second sectional view of a mounting state of a tire air pressure detecting device in an air pressure detecting device relating to the present invention,

Fig. 4 is a view explaining a wheel mounted with a tire air pressure detecting device relating to the present invention.

[0013] Fig. 1 shows a side elevation view of a motorcycle provided with an on vehicle tire air pressure detecting device relating to the present invention, a motorcycle 10 as a vehicle is constituted of a handlebar 11, a front fork 12 and a front wheel 13 mounted freely steerably on a lower section of the handlebar 11, a front cover 14 and a front inner cover 15 for covering a lower section of the handlebar 11 and an upper section of the front fork 12, a floor step 16 arranged in a rearward of a lower section of the front cover 14, a body cover 17 continued upward at a rear section of the floor step 16, a power unit 18 extending to a rearward from an inner side of the body cover 17, a rear wheel 21 mounted to a rearward of the power unit 18, and an air suspension device 22 respectively suspended between a rear end section of the power unit 18 and a vehicular body frame, not illustrated, inside the body cover 17.

[0014] Here, numeral 24 denotes a meter cover mounted on a handlebar 11, numerals 25 and 26 denote a wheel and a tire of the front wheel 13, numeral 27 denotes a carburetor for supplying fuel to an engine constituting the power unit 18, numerals 31 and 32 denote a wheel and a tire of the rear wheel 21, and numeral 33 denotes a seat.

[0015] An on vehicle tire air pressure detecting device 40 (hereinafter referred to as "air pressure detecting device 40") of the present invention, is constituted of a tire air pressure detecting device 41 as an air pressure sen-

sor for a front wheel for detecting an air pressure of the tire 26 by mounting the device 41 on the wheel 25 of the front wheel 13, a tire air pressure detecting device 42 as an air pressure sensor for a rear wheel for detecting an air pressure of the tire 32 by mounting the device 42 on the wheel 31 of the rear wheel 21, an air suspension air pressure detecting device 43 mounted on the air suspension device 22, for example, an engine output adjusting device 44 for adjusting an opening degree of a throttle by mounting the device 44 on a carburetor 27, a control device 45 by operating a warning device, not illustrated, by receiving a signal transmitted from the tire air pressure detecting devices 41 and 42, and the air suspension air pressure detecting device 43, and controlling the engine output adjusting device 44, a display device 46 for displaying the air pressure of the tire 26 of the front wheel 13, the air pressure of the tire 32 of the rear wheel 21, and the air pressure of the air suspension device 22 by receiving signal from the control device 45, and the warning device.

[0016] The control device 45, for example, is arranged downward the seat 33 and the display device 46, for example, is mounted on a meter cover 24.

[0017] Fig. 2 shows a first sectional view illustrating a mounting state of a tire air pressure detecting device 41 in an air pressure detecting device relating to the present invention, and with regard to the tire air pressure detecting device 41 for the front wheel will be explained. With regard to a tire air pressure detecting device 42 for the rear wheel, since the structure is the same as the tire air pressure detecting device 41 for the front wheel, the explanation in Fig. 2 and afterward will be abbreviated.

[0018] The tire air pressure detecting device 41 is constituted of a detecting device main body 51, and a tire valve 52 mounted on the detecting device main body 51 for the purpose of opening only when supplying air to inside the tire 26 (refer to Fig. 1), and for the purpose of being closed so as not air supplied to inside the tire 26 being flowed out to an outer section, the detecting device main body 51 is arranged on a recessed section 54 provided on a bottom of a rim 53, the tire valve 52 is inserted into a valve inserting hole 55 opened on the bottom of the rim 53, a nut 57 is threaded into an external thread section 56 provided on an outer peripheral surface of the tire valve 52, and the tire air pressure detecting device 41 is mounted on the wheel 25.

[0019] Fig. 3 shows a second sectional view illustrating the mounting state of the tire air pressure detecting device in the air pressure detecting device relating to the present invention.

[0020] The wheel 25 is constituted of flange sections 61 and 61, bead seat sections 62 and 62 provided on inner sides of these flange sections 61 and 61, hump sections 63 and 63 protuberantly molded on an inner side of the these bead seat sections 62 and 62, a rim drop section 64 dented between respective these hump sections 63 and 63, and the recessed section 54 de-

scribed above provided in this rim drop section 64.

[0021] The bead seat section 62 is a portion holding a bead section of the tire 26 (refer to Fig. 1).

[0022] The hump section 63 is a projecting section in a shape of a ring for preventing the tire 26 from coming off from the bead seat section 62 of the wheel 25.

[0023] The rim drop section 64 is a portion for facilitating attachment /detachment of the tire 26 by deeply dropping the section 64.

[0024] The tire air pressure detecting device 41 is a device mounted on an outer surface 51a of the detection device main body 51 on the rim 53 being an inner side by only an amount d from a bottom surface (described later) of the rim drop section 64. In the meantime, numeral 67 denotes a seal member for preventing air from leaking to an outer section from an air chamber inside the tire 26, numeral 68 denotes a communicating hole (blocked by valve element not illustrated) provided inside a tire valve 52 for communicating an inside /outside of the tire 26.

[0025] As explained in Fig. 2 and in Fig. 3 described above, the present invention is characterized in that in the air pressure detecting device 40 for detecting the tire air pressure by the tire air pressure detecting device 41 mounted on the rim 53 of the wheel 25 for the motorcycle 10 (refer to Fig. 1), wherein, the rim drop section 64 dented in a shape of a ring is provided on the inner side of the bead seat sections 62 of the rim 53 for holding the bead sections of the tire, further, the recessed section 54 is provided on this rim drop section 64, and the detecting device main body 51 of the tire air pressure detecting device 41 is accommodated in the recessed section 54.

[0026] By accommodating the detecting device main body 51 in the recessed section 54 of the rim 53, when assembling the tire 26 on the wheel 25 by utilizing the tire changer or the like, or removing the tire 26 from the wheel 25, the bead sections of the tire 26 are possible to be prevented from interfering with the detecting device main body 51, and the damaging of detecting device main body 51 is prevented.

[0027] Here, by constituting a surface, connected intersection positions 64b and 64b formed by intersecting side surfaces 54a and 54a of the recessed section 54 and the slant surfaces 64a and 64a of the rim drop section 64, to each other in a peripheral direction and in a width direction, as a bottom surface 64c of the rim drop section 64, a distance (radius) from the center of the wheel 25 to the bottom surface 64c is set as R1, a distance (radius) from the center of the wheel 25 of the bottom surface 54b of the recessed section 54 is set as R2.

[0028] Returning to Fig. 2, the detecting device main body 51 is a body formed in a shape of a curve along an inner side surface 53a (that is, a total surfaces added a bottom surface 64c of the rim drop section 64 to a bottom surface 54b of the recessed section 54) of the rim 53.

[0029] When a radius of an inner surface 51b of the

detection device main body 51 is set as R3, and a radius of an outer surface 51a thereof is set as R4, a relationship described hereinafter is satisfied.

$$\textcircled{1} R4 \leq R1, \textcircled{2} R2 \leq R3, \textcircled{3} R4 \leq R3$$

[0030] For example, in a case where a tire air pressure detecting device 41 is commonly utilized and mounted on the wheel with a rim diameter having 10 inch - 19 inch size, (1) the radius R4 of the outer surface 51a of the detecting device main body 51 is set smaller than the radius R1 of the bottom surface 64c of the rim drop section 64 (refer to Fig. 3) of the wheel of 10 inch size of the minimum diameter, even if a tire air pressure detecting mean 41 is mounted on any wheels of 10 inch - 19 inch size, on an outer surface 51a of the detecting device main body 51 is not protruded on outside from the bottom surface 64c of the rim drop section 64. That is, a relationship of $R4 \leq R1$ is satisfied.

[0031] (2) By setting the radius R3 of an inner surface 51b of the detecting device main body 51 is larger than the radius R2 of the bottom surface 54b of the recessed section 54 of the wheel for the maximum diameter 19 inch size, even if the tire air pressure detecting mean 41 is mounted on any wheels of 10 inch - 19 inch size, the inner surface 51b of the detecting device main body 51 is not interfered with the bottom surface 54b of the recessed section 54. That is, a relationship of $R2 \leq R3$ is satisfied.

[0032] (3) When R1 (dimension for wheel of 10 inch size) \leq R2 (dimension for wheel of 19 inch size) is established, from the relationships (1) and (2) described above, since $R4 \leq R1 \leq R2 \leq R3$ is established, a relationship $R4 \leq R3$ is satisfied.

[0033] As explained in Fig. 2 described above, the present invention is characterized in that in the air pressure detecting device 40 (refer to Fig. 1) for detecting the tire air pressure by the tire air pressure detecting mean 41 mounted on the rim 53 of the wheel 25 of the motorcycle 10 (refer to Fig. 1), wherein, the detecting device main body 51 is a body contrived in a shape of a curve along the inner side surface 53a of the rim 53.

[0034] By contriving the detecting device main body 51 in a shape of a curve along the inner side surface 53a of the rim 53, a projecting section to a tire 26 (refer to Fig. 1) side of the detecting device main body 51 can be eliminated, and when the tire 26 is assembled on the wheel 25 or the tire 26 is removed from the wheel 25, the bead sections of the tire 26 is prevented from interfering with the detecting device main body 51 and damaging of the detecting device main body 51 is prevented.

[0035] Fig. 4 (a) and Fig. 4 (b) show a view explaining a wheel mounted with the tire air pressure detecting device relating to the present invention, Fig. 4 (a) shows a side elevation view, and Fig. 4 (b) shows a sectional view taken on line b - b.

[0036] In Fig. 4 (a), the wheel 25 is contrived to be

integrally molded a weight section 69 for being balanced with the tire air pressure detecting device 41 with the rim 53 at a position shifted at an angle of 180° in a peripheral direction from a position mounted with the tire air pressure detecting device 41 (refer to Fig. 3) on the rim 53, that is, from the recessed section 54 (refer to Fig. 3).

[0037] Fig. 4 (b) illustrates the weight section 69 provided by being projected on a wheel center side of the rim 53.

[0038] As explained hereinbefore, the present invention is characterized by integrally molding the weight section 69 for being balanced with the tire air pressure detecting device 41 with the rim 53 at the position shifted an angle of 180° in a peripheral direction from the position mounted with the tire air pressure detecting device 41 on the rim 53.

[0039] By being integrally molded the weight section 69 with the rim 53, a necessity to mount or to affix specific weight in an attempt to be in a good wheel balance is eliminated, workability is improved.

[0040] In the meantime, the tire air pressure detecting device 41 for the front wheel and the tire air pressure detecting device 42 for the rear wheel explained in an embodiment of the present invention may well be the same dimension with each other or may be differed from each other according to the size of the tire.

[0041] Further, the tire air pressure detecting device 40 can be applied to not necessarily the motorcycle, but to a three-wheeled vehicle or to a four-wheeled vehicle.

[0042] The present invention exhibits the following effects according to the constitution described above.

[0043] An on vehicle tire air pressure detecting device of claim 1 is provided with a rim drop section dented in a shape of a ring on an inner side of a bead seat section of a rim, wherein, since a recessed section is provided in the rim drop section, and an air pressure sensor is accommodated in the recessed section, when a tire is assembled to a cast wheel by utilizing a tire changer or the like or when the tire is removed from the cast wheel, the bead sections of the tire are capable of being prevented from interfering with the air pressure sensor, and damaging of the air pressure sensor is prevented.

[0044] In an on vehicle tire air pressure detecting device in claim 2, since an air pressure sensor is formed in a shape of a curve along an inner side surface of a rim, a projecting section to a tire side of the air pressure sensor can be eliminated, when the tire is assembled to a cast wheel, or when the tire is removed from the cast wheel, the bead sections of the tire are prevented from interfering with the air pressure sensor, and damaging of the air pressure sensor is prevented.

[0045] In a wheel for mounting an on vehicle tire air pressure detecting device in claim 3, since a weight section is integrally molded with the rim for being balanced with an air pressure sensor at a position shifted at an angle of 180° in a peripheral direction from a position where the air pressure sensor is mounted on a rim, a cast wheel can be easily in balance, a necessity to

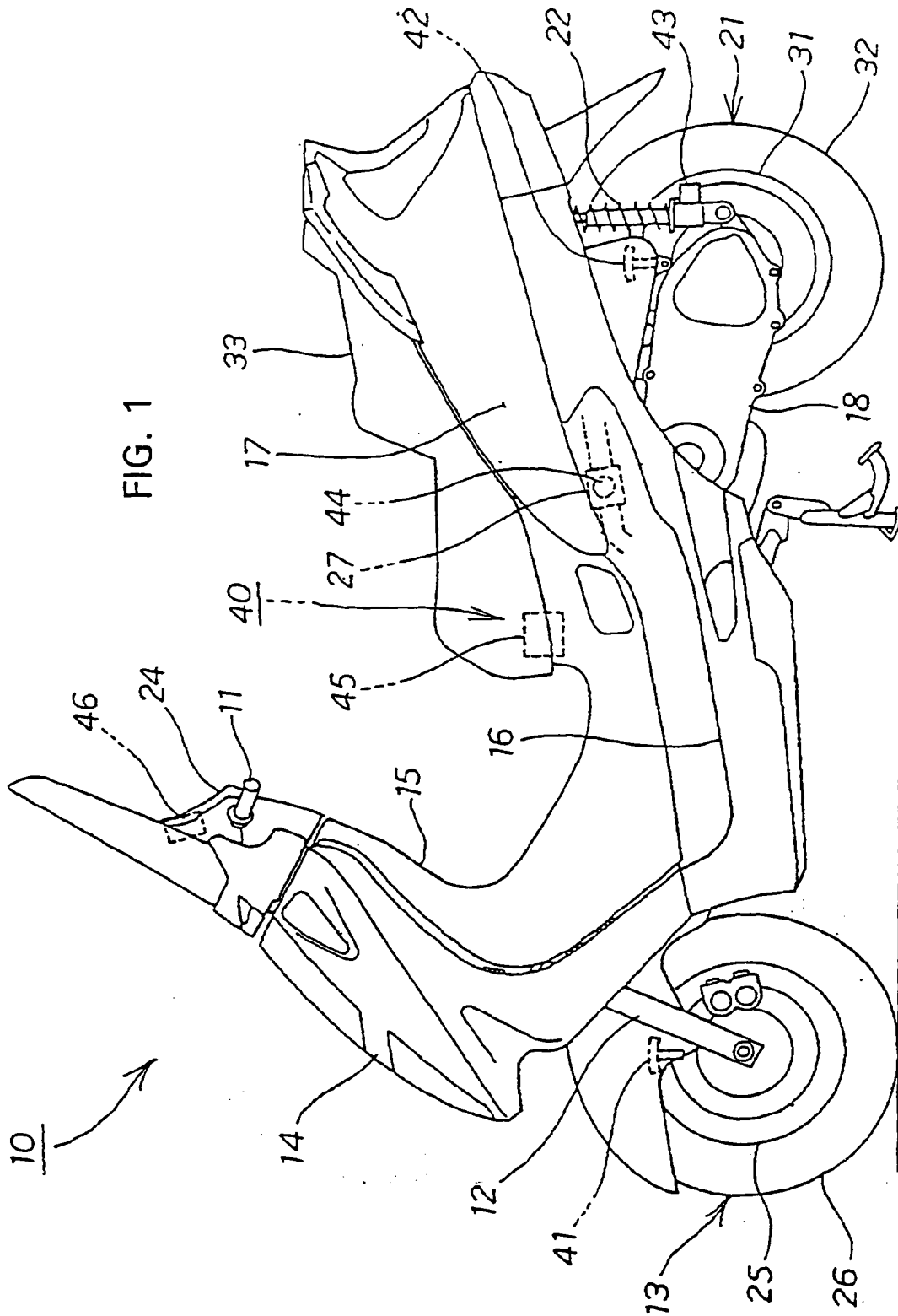
mount or to affix specific weight in an attempt to be in a good wheel balance is eliminated. workability is improved.

[0046] In summary, a rim drop section 64 dented in a shape of a ring is provided on an inner side of a bead seat section 62 of a rim 53 for holding a bead section of a tire, further, a recessed section 54 is provided on this rim drop section 64, and to this recessed section 54 a detecting device main body 51 of a tire air pressure detecting device 41 is accommodated.

[0047] When a tire is assembled on a cast wheel by utilizing a tire changer or the like, or when the tire is removed from the cast wheel, the bead sections of the tire are prevented from interfering with an air pressure sensor, and damaging of the air pressure sensor is prevented.

Claims

1. An on vehicle tire air pressure detecting device (40) for detecting a tire air pressure by an air pressure sensor (41, 42) mounted on a rim (53) of a vehicular cast wheel (25, 31), **characterized in that** a rim drop section (64) dented in a shape of a ring is provided on an inner side of bead seat sections (62) of the rim (53) for holding bead sections of the tire (26, 32), further, the rim drop section (64) is provided with a recessed section (54), and the air pressure sensor (41, 42) is accommodated in the recessed section (54).
2. An on vehicle tire air pressure detecting device (40) for detecting a tire air pressure by an air pressure sensor (41, 42) mounted on a rim (53) of a vehicular cast wheel (25, 31), **characterized in that** the air pressure sensor (41, 42) is formed in a shape of a curve along an inner side surface (53a) of the rim (53).
3. A cast wheel for mounting an on vehicle tire air pressure detecting device (40) as set forth in claim 1 or claim 2, **characterized by** integrally molding a weight section (69) with a rim (53) for being balanced with an air pressure sensor (41, 42) at a position shifted at an angle of 180° to a peripheral direction from a position where the air pressure sensor (41, 42) is mounted on the rim (53).



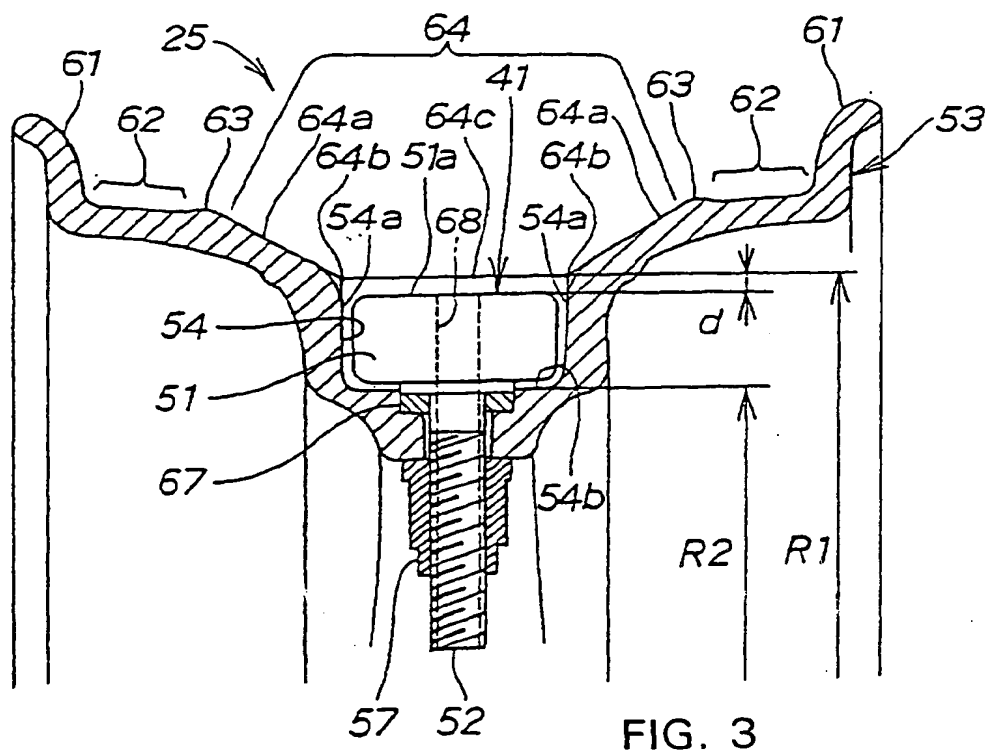
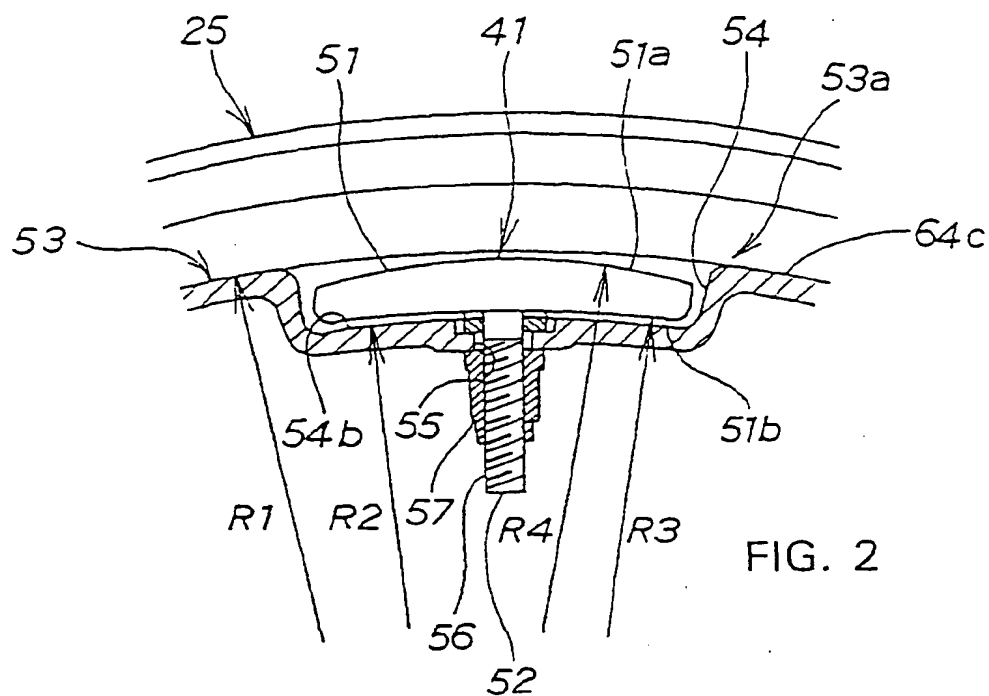
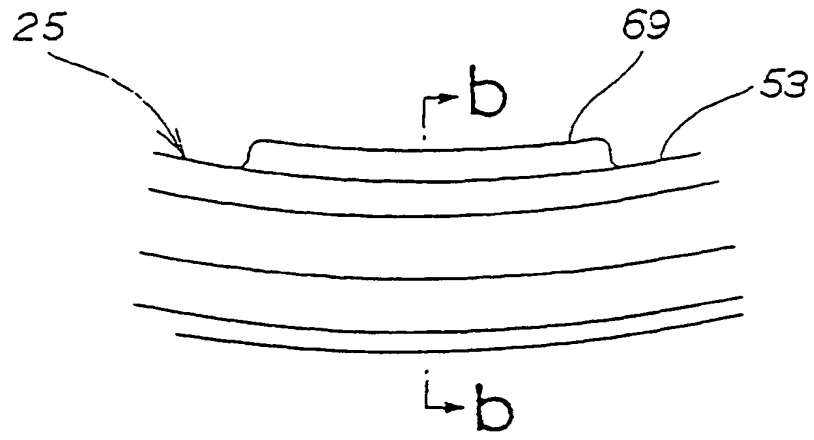
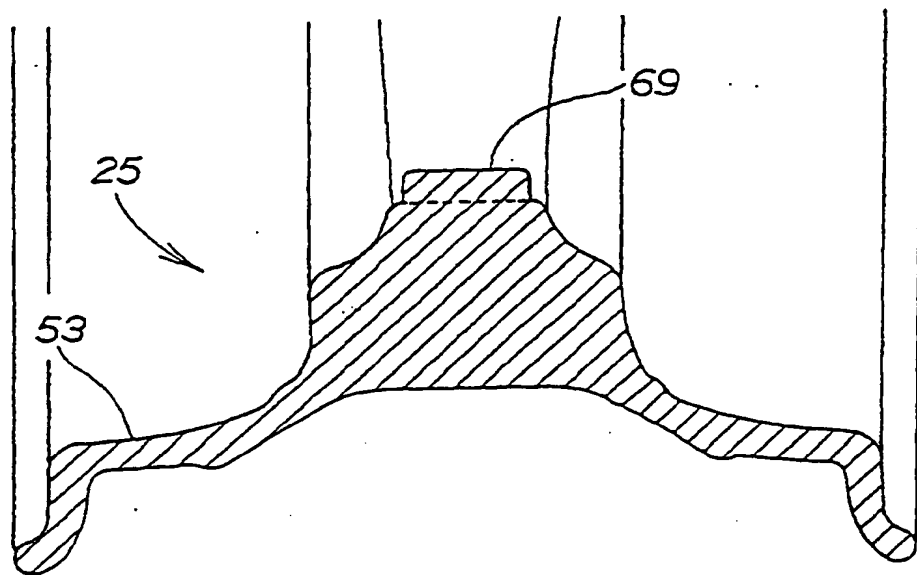


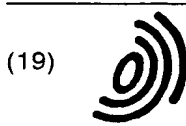
FIG. 4



(a)



(b)



(19)

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(54) Vehicle tire air pressure detecting device and cast wheel for mounting the device

(57) A rim drop section (64) dented in a shape of a ring is provided on an inner side of a bead seat section (62) of a rim (53) for holding a bead section of a tire, further, a recessed section (54) is provided on this rim drop section (64), and to this recessed section (54) a detecting device main body (51) of a tire air pressure

detecting device (41) is accommodated.

When a tire is assembled on a cast wheel (25) by utilizing a tire changer or the like, or when the tire is removed from the cast wheel (25), the bead sections of the tire are prevented from interfering with an air pressure sensor (41), and damaging of the air pressure sensor (41) is prevented.

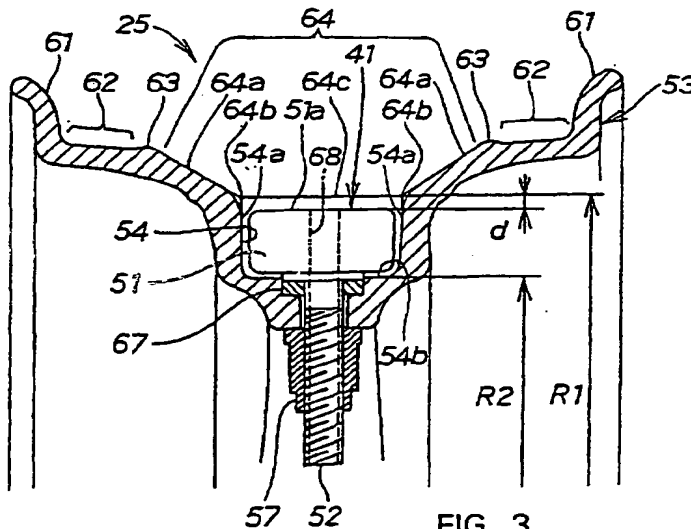


FIG. 3

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European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 11 3768

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	DE 196 26 446 A (MANNESMANN AG ;CONTINENTAL AG (DE)) 8 January 1998 (1998-01-08)	1	B60C23/04 B60B21/02 B60B21/04
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A	DE 39 30 095 A (WABCO WESTINGHOUSE FAHRZEUG) 14 March 1991 (1991-03-14) * figure 1 *	1	
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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 10 December 2003	Examiner Billen, K
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03 82 (P403)



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Application Number

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent
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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 01 11 3768

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claim : 1 2

By accommodating the sensor in a recessed section of the rim and forming the pressure sensor in a shape of a curve along an inner side surface of the rim a damage of the sensor is prevented while the tire is removed from the wheel.

2. Claim : 3

By integrally molding a weight section with the rim on the opposite side of the air pressure detecting device a unbalance of the wheel is avoided.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 11 3768

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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10-12-2003

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82